ISSN 0704-3716

Canadian Translation of Fisheries and Aquatic Sciences

No. 5251

Rainbow trout farming polluting the Archipelagic Sea

J. Eklund

Original title: Kirjolohen kasvatus pilaa Saaristomerta

In: Suomen Luonoto Volume 43(4): 24-27, 1984

Original language: Finnish

Available from:
Canada Institute for Scientific and Technical Information
National Research Council
Ottawa, Ontario, Canada K1A 0S2

1986

Fisheries & Oceans
LIBRARY
JAN 19 1987
BIBLIOTHÈQUE
Pêches & Océans

8 typescript pages

Rainbow trout farming started in Finland in the 1960's. In the beginning, the trout was farmed in inland earth ponds. However, inland farming is restricted by a shortage of suitable farm locations and the rapid pollution of waters.

The first marine farm began to operate in Kustavi, in the Archipelagic Sea, in the beginning of the 1970's. The rainbow trout is farmed in the sea in floating net cages, and there is no shortage of suitable places. After the initial experiments, rainbow trout farming expanded rapidly.

In 1982, fish farmers produced 6 325 t of rainbow trout. The total Finnish catch was about 130 000 t in the same year. The majority of the catch, about 80 000 t, consisted of the Baltic herring. The most important scaly fish were perch (10 000 t) and pike (8 000 t), followed by rainbow trout, Coregonus albula, cod, Leuciscus rutilus, and Coregonus lavaretus.

The value of rainbow trout production, Fmk 354 mill. in 1982, exceeds that of the total catch of all other species and corresponds to more than 40 % of the value of the professional total catch. Rainbow trout is economically the most important fish species in Finland.

There were 293 fish farms in Finland in 1982. The inland farms produced 3 099 t (195 farms) and the marine ones 3 226 t (98 farms). The inland farming is decreasing, while farming in the sea is increasing. The majority of the marine farms are in the Archipelagic Sea, where they are concentrated in the municipalities of Kustavi, Houtskari, Rymattyla, and Dragsfjard. The farms in the Turku Water District produced in 1982 about a third of the entire Finnish production.

Gaps in law and supervision

When fish farming started, it coincided with a gap in the legislation and environmental supervision. The Water Law prohibits water pollution and changing of water courses. However, the 1962 Statute concerning Preventive Measures for Water Protection is not familiar with fish farming. Unless a fish farmer submitted an advance notification, his water district may not have been aware of his farm at all. If, on the other hand, a fish farmer

did send in a notification, the water authority may have neglected to process it, since the farm would simultaneously have applied for a licence from the Water Rights Court.

It is very difficult to supervise even the quantities being reared. The effects of the farms on waters have been monitored very weakly, and therefore, little knowledge exists about the negative effects of the farms on waters. There were 70 fish farms in the Turku Water District in 1983. Thirty of these had notified the District (most farms did it afterwards), and 26 had applied for a licence from the Water Rights Court. Only two farms had a legally valid licence.

Fish farming coincided with a gap in the fish industry policies as well. The farming developed on conditions dictated by profitability and markets to its present scope, before the fish industry authorities even had time to think how much and what kind of fish farming was needed in Finland.

Farming in nets, feeding with dry feed

The rainbow trout is reared in the sea almost exclusively in net cages. The cages, made of small-mesh netting, are anchored in a strait or some other place where water changes. The fry are brought to a station in the spring when they 1 year old, to be reared there for 1 or 2 summers. After the second summer, the fish weigh 1 - 1.5 kg.

The rainbow trout feeds on dry feed or Baltic herring (Clupea harengus membras). The dry feed, consisting of imported materials, contains mostly fish meal and oil, wheat, and soya. The Baltic herring is domestic, and it is fed to the trout either chopped up or ground and mixed with the dry feed.

Pollution load

In their net cages, the fish feed and defecate. Wasted feed and fish excrements sink to the bottom. Part of the nutrients dissolve immediately in the water, while the rest is gradually liberated from the bottom sludge. The sludge is carried by currents to the nearest depression.

The dry feed contains about 1 % phosphorus and 7 % nitrogen, while the herring contains 0.4 % phosphorus and 3 % nitrogen. Two kg of dry feed or 6 kg of fish is needed to produce 1 kg of rainbow trout. This means that when dry feed is

used, each kg of rainbow trout requires an input of 16 g phosphorus and 100 g nitrogen into the water, and if fish is used as feed, it requires an input of 20 g phosphorus and 150 g nitrogen.

The municipalities of Kustavi and Taivassalo have about twenty fish farms, which, according to the producers' reports, produced about 800 t of fish in 1983. According to the calculation above, the farms released into the sea 13 t phosphorus and 90 t nitrogen. If the rearing season is 6 months long, the per-day load is 72 kg phosphorus and 500 kg nitrogen.
The central sewage treatment plant of the town of Turku discharged in the same year 44 kg phosphorus into the sea daily. In the municipalities of Kustavi and Taivassalo, the load from the fish farms corresponds to the untreated waste waters of a town with 25 000 inhabitants. The share of fish farming of the total phosphorus load is about 80 %, calculated for a whole year. Other loaders in Kustavi and Taivassalo are the population and scattered pollution. In the summer, the fish farms are responsible for an even greater share of the pollution load.

The load can be reduced by decreasing the nutrient content of the feed or by improving the feed coefficient. Due to new developments in feeds, nutrient releases per kg of fish produced are smaller than they were at the initial stages of fish farming. Another way to reduce the pollution load is to collect sludge in basins. Collecting sludge is easy with earth ponds but has not yet been done successfully with net cages. The sea must still be trusted to absorb the waste.

Does fish farming expel the Baltic herring ?

Releasing nutrients into the sea results in eutrophication. There is no difference in this respect between nutrients coming from a pig farm, a sewage treatment plant, or a fish farm. An increase in the quantity of nutrients released can be easily recognized in waters close to towns by the following symptoms :

- Production of algae increases. Plankton floating in the water manifests itself in the color of the water and its taste, while the bottom algae make the shores slimy, and shore vegetation grows taller and more luxuriant.

- Benthic organisms change, and oxygen conditions on the bottom become impaired.

- The fish fauna changes. A growth in the primary production leads to a growth in the fish production as well, but the value of the catch may decrease, when the less valuable fish multiply. Fishery becomes more difficult, because the fishing gear becomes slimy.

Most of the fish farms at Kustavi are situated in the Stroom strait. People living on the shores of the strait have complained long of the disadvantages of eutrophication. In the strait, the phosphorus content of the water is about 20 µ/L, while out in the open sea at each end of the strait it is 13 - 14 µ/L. The chlorophyll content, which reveals the quantity of plant plankton, is seasonally double compared with that in the open sea. The benthic fauna has changed as a result of eutrophication, and filamentous alga vegetation is more abundant in the strait than elsewhere in Kustavi.

No professional fishing takes place in Stroom. However, Asikaistenlahti (Bay) north of Luonnonmaa, Naantali, contains an important spawning ground for the Baltic herring and an important hoop-netting area. Asikaistenlahti can be entered through three different straits, each of which has a fishery . The hoopnets used for Baltic herring get clearly more slimy near the fish farms than elsewhere in the bay. It is obvious that the sliming affects the catches. In summer 1983, the catch was 2 t per hoopnet, while the normal catch amounts to 7 - 8 t. The catch has declined also in areas where sliming is not strong. The fishermen suspect that fish farming will expel the Baltic herring which no longer migrates to its spawning grounds through the straits. Aquarium experiments carried out in fall 1983 showed that e.g. a dry feed solution (about 0.7 g/L) may drive away the Baltic herring.

Large-scale fish farms instead of family undertakings

Many working groups and official declarations have wishfully stated that fish farming should be practised preferably as a family business to supplement another livelihood such as fishing. It seems that this will not happen. The size of the farms in the Archipelagic Sea is growing, today's average size being 40 t. Five years ago the average size was 15 t. The major farms are frequently backed by external money and investors. When external money is invested in fish farming, it is obvious that the primary task of the farm is to bring profit to the investor.

The fish farmers emphasize the importance of their farms as employers in the archipelago. Some municipalities, such as Kustavi, favor fish farming because of the employment and tax income involved. For the same reasons, the state supports fish farming just as it supports other enterprises in development areas. In 1983, the Ministry of Trade and Industry granted investment and start-up aid amounting to Fmk 3.3 mill. to fish farming plants to be established in the county of Turku and Pori.

These matters should be studied in greater detail. It is true that fish farming requires manpower, and it requires it primarily in the fall season. On the other hand, enterprises in development areas do not pay municipal taxes during the first five years.

Fish farming is growing, and new farms are being established in the sea. The domestic consumption can hardly be increased, which is indicated by the price of the rainbow trout, which for the last three years has staid at Fmk 20 per kg. Exports to the USA and West Germany have started, and these markets are large.

However, fish farming may encounter its limits unexpectedly. The exports may be blocked suddenly by a spread of fish diseases, such as the spread of VHS from Estonia to Finland. Even without this kind of catastrophe, the expansion possibilities of fish farming will be limited at least locally by eutrophication and opposition by fishermen or by people living on sea shores.

The future – rainbow trout or Baltic herring ?

Fish farming competes with traditional fisheries. The rainbow trout competes with salmon and trout for the same markets and replaces the scaly fishes. If the suspicions concerning the expulsion of Baltic herring from fish farming areas turn out to be true, fish farming is a threat to the Baltic herring fishery in some locations. The traditional fisheries provide employment, use domestic natural resources, and have no loading effect on the waters. Fish farming consumes imported feeds, has a loading effect on waters, and provides seasonal employment for the islanders.

In my opinion, fish farming should not be a dominant livelihood in the archipelago. There is a need for fish farming, but it should be a supplement to other industries. This is pointed out also in the report (dated 13.10.1983) of the Working Group on Fish Farming, appointed by the Ministry of Agriculture and Forestry. The Working Group came to the conclusion that food fish should be produced by small family businesses.

The rainbow trout is an industrial product just like the broiler chicken or the super pig from a large-scale pig farm. We have to make our choice between the Baltic herring and the rainbow trout.

FISH FECES FALL IN FUNNELS : A PROMISING TREATMENT METHOD FOR FISH FARMS
(from Miljoaktuellt 3/84*)

A new method for collecting the waste produced by fish reared in net cages in the sea has been tested for a year in the St Anna archipelago off the eastern shore of Sweden. The experimentor claims that the method can be used both in inland waters and in the sea.

A big plastic funnel is constructed under the net cage to receive the waste feed and the fish feces, which are then collected by pumping.

In a trial observed by the Limnological Institute of Lund University, the device removed 85 % of the phosphorus leaking from the cage and 55 - 75 % of the nitrogen. The fish farmer could save as much as a fourth of his feed costs, because it would be possible to ration the feed better.

After the fish were fed, the waste was pumped by a computerized system. The collected waste is three times as rich in nutrients as cow manure and can be used as an agricultural fertilizer. Trials have been carried out also with fertilization of algal cultures.

---

* Miljoaktuellt is a Swedish environmental periodical. Translator's note.

UNEDITED TRANSLATION
For information only
TRADUCTION NON REVISEE
Information seulement

Phosphorus quantities at the St Anna fish farming plant, where net cages were equipped with the new treatment device (October 1983) :